

# **Role of Knowledge among Yemeni Agricultural Specialists in Applying the Procedures to be followed to Benefit from Agricultural Waste**

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## **ABSTRACT**

This study seeks to explore the role of knowledge among Yemeni agricultural specialists in applying the procedures to be followed to benefit from agricultural residues. Through the primary data collected for a sample of 120 respondents from agricultural specialists. The study concluded that there is an effect of knowledge in the application of procedures, but the effect of knowledge increases greater there is the possibility of transferring knowledge to the competent authorities and farmers to implement these procedures on the ground. Moreover, the more there is an equal ratio of male and female agricultural specialists, the greater the impact will be, because the process of transferring knowledge will include male and female farmers, thus facilitating the better application of procedures, and the role of knowledge in implementing procedures is greater. The study recommends that females should be encouraged to enroll in agricultural education, as well as employment in government institutions that work in the agricultural sector, to contribute to the transfer of knowledge, experiences and everything new about agriculture, including recycling agricultural waste to female farmers.

**KEYWORDS:** *Knowledge, Procedures, Agricultural Waste, Agricultural specialists*

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## **INTRODUCTION**

The agricultural sector in Yemen is considered an important sector for other economic sectors, and it is one of the main sectors that increase the size of the gross domestic product; Most people obtain their power by 74%, and it contains nearly 2 million workers and constitutes about 53% of the total workforce to help create job opportunities and alleviate poverty, especially in rural areas (Ismail Al-Obre 2021) (Yasmeen Alwan 2018).

Agricultural waste is of economic importance, so the recycling process is very carefully considered by states as it is part of the agricultural product, as agricultural waste represents 40-50% of the main product it has no use as a loss from the total production (Salih Mahmoud Al-Hejaz 2002) and agricultural waste is defined as the waste resulting

from the cultivation and processing of raw agricultural products such as fruits, vegetables, meat, poultry, dairy products and crops (F. O. Obi 2016).

And that the problem of getting rid of agricultural waste in and of itself is an economic, health, social and environmental problem, so we find that maximizing the use of agricultural waste is achieved by increasing the knowledge of workers in this sector that produces many procedures by using them as raw materials and raw materials (Zakka 2018). Uneconomic dealing or unconscious disposal of agricultural waste of all kinds is one of the important aspects of the environmental problem because it does not only include waste of economic resources, but also includes serious pollution to the environment, and waste of its various elements, and the problem of



irrational dealing with agricultural waste increases (Kotb 2010).

And that practical knowledge has a strong positive and ethical relationship with the overall degree of performance of agricultural extension agents for the recycling of agricultural waste, and those quantitative variables have a clear impact on the overall degree of the reality of the administrative performance of agricultural extension agents for extension activities in the recycling of agricultural waste. Enhancing the administrative performance of agricultural extension agents for extension activities from rehabilitation, not recycling agricultural waste, is one of the most important procedures followed in order to benefit from agricultural waste (Alhamdany 2020).

This study comes to explore the role of knowledge of Yemeni agricultural specialists in applying the procedures that must be followed in order to benefit from agricultural waste. The importance of this study lies in its ability to draw the government's attention to more interest in how to increase the knowledge of agricultural specialists and farmers, which will contribute to the application of procedures in the correct manner.

## **REVIEW OF LITERATURE**

Knowledge has a relationship in improving performance, the greater the knowledge, the greater the impact. The study (Ibrahim 2018) shows that increasing knowledge through the work of seminars and extension courses at the level of government centres, governorates, centres and villages work to raise the capabilities of workers in the agricultural field and raise awareness among farmers and thus facilitates the process of implementing recommendations or the procedures issued regarding the utilization of agricultural waste in order to achieve an economic return if it is recycled.

And (Alhamdany 2020) explained in his study that the practical variables have a strong positive relationship with the total degree of administrative performance of agricultural extension agents in order to recycle agricultural waste and that they have a clear impact on the overall degree of the reality of the administrative performance of agricultural extension agents for the application of extension activities for the recycling of agricultural waste. The study concluded that enhancing the administrative performance of agricultural extension agents facilitates the process of implementing extension activities, as it is one of the procedures that help in the recycling of agricultural waste. And the knowledge needed of agricultural specialists needs to develop plans and training programs to raise and develop the respondents' knowledge in the field of

waste recycling in order to facilitate the implementation of interventions related to the recycling of agricultural waste (Sayed A. M. Rashad 2017). And the study (Hashem 2014) indicated the possibility of benefiting from agricultural waste and maximizing the benefit from it by raising the level of knowledge for workers in the field of agricultural and environmental extension. And when examining the current household recycling and waste management behavior in Korea, the study found that older and wealthy people participate in waste management to reduce and recycle more as a result of their knowledge accumulation and this facilitated the application of practices to benefit from agricultural waste (Seunghae Lee 2011). While the study (A. A. Issa 2015) concluded that it is necessary to transfer knowledge related to the methods of benefiting from agricultural waste to workers as well as farmers, such as providing sufficient technical information on agricultural waste and raising cultural awareness among farmers to properly deal with agricultural waste. And the study (Gu 2021) suggested that future research should focus on the diversity of livestock industry waste and on how to better integrate this waste into other related industries. Raising awareness of agricultural waste has a major role in increasing the motivation of farmers to benefit from this waste because of its economic feasibility as a result of recycling the agricultural waste as well as maintaining a clean environment (Muheisen 2017).

It is evident from the previous reference studies that increasing the knowledge of agricultural workers plays a great role and positively affects the increase of knowledge among decision-makers to take appropriate decisions in the exploitation of agricultural waste and also has a positive impact on farmers so that the recommended procedure is applied in order to benefit from their agricultural waste.

## **MATERIALS AND METHODS**

In this study, descriptive and analytical research method was used in order to study the role of knowledge of Yemeni agricultural specialists in applying the procedures to be followed to benefit from agricultural waste, by identifying the level of their knowledge about agricultural waste as well as the procedures that should be used to exploit these wastes. Primary and secondary data were used, as the study relied on obtaining primary data by distributing a questionnaire to Yemeni agricultural specialists of various scientific qualifications, grades and job positions who work in agricultural educational, research and service institutions, numbering 120 respondents. Respondents were asked to give their opinion of 22 indicators in order to assess the role of

knowledge among the surveyed specialists on the application of procedures to benefit from agricultural waste. A five-point Likert scale was used to score the independent and dependent variable scores, which consisted of five points as follows: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Weighted -

2, -1, 1, 2, 3, respectively. Statistical analysis of the data was carried out using the SPSS-26 version, and the variables were measured with mean, standard deviation, and simple linear regression. As for secondary sources, they are obtained through published research, journals and scientific theses.

## RESULT AND DISCUSSION

### 1. PERSONAL FACTORS

The data in the table ( ) on the personal factors of the respondents indicated that the percentage of "males" was 78.3% higher than the percentage of females among the respondents and that the highest age group of respondents was the category (25-34) with a percentage of 39.2%, while most of the respondents were from the group "Married" with a percentage of 71.7%, and half of the respondents hold a "Bachelor's" qualification, at a rate of 50% of the total respondents.

**Table 1 Gender, Age, Social State and Qualification -wise Distribution of the Respondents**

| Personal factors | Indications   | Frequency | Percent |
|------------------|---------------|-----------|---------|
| Gander           | Female        | 26        | 21.7    |
|                  | Male          | 94        | 78.3    |
| Age              | From 25 to 34 | 47        | 39.2    |
|                  | From 35 to 44 | 41        | 34.2    |
|                  | From 45 to 54 | 19        | 15.8    |
|                  | From 55 to 64 | 11        | 9.2     |
|                  | Above to 65   | 2         | 1.7     |
|                  | Widowed       | 1         | 0.8     |
| Social State     | Single        | 32        | 26.7    |
|                  | Married       | 86        | 71.7    |
|                  | Divorced      | 1         | 0.8     |
|                  | Widowed       | 1         | 0.8     |
| Qualification    | Diploma       | 4         | 3.3     |
|                  | Bachelor      | 60        | 50.0    |
|                  | Master        | 35        | 29.2    |
|                  | Doctorate     | 20        | 16.7    |
|                  | Total         | 120       | 100     |

### 2. PROFESSIONAL FACTORS

It is cleared from the table ( ) on the respondents' occupational factors that three-fourths of the respondents 75% of the nature of their work is "agricultural researchers", and that 55% of the respondents have a technical position of the Career Center, and that the highest period of service in the agricultural field for the respondents is the category (less than 5 years) with a percentage 30.8%, while more than half of the respondents did not receive training in the field of agricultural waste recycling "No" by 63.3%, while 55% of the respondents received training in the field of environmental preservation "Yes", and 28.5% of the respondents were the source of their information about recycling agricultural waste "internet".

**Table 2 Type of profession (work nature), Career Center, Period of Service, Training in the recycling of agricultural waste and Environmental conservation, Source information -wise Distribution of the Respondents**

| Professional factors             | Indications               | Frequency | Percent |
|----------------------------------|---------------------------|-----------|---------|
| Type of profession (work nature) | Agri-researcher           | 90        | 75.0    |
|                                  | Adaptive (administrative) | 14        | 11.7    |
|                                  | Agricultural guide        | 16        | 13.3    |
| Career Center                    | Administrative            | 37        | 30.8    |
|                                  | Technician                | 66        | 55.0    |
|                                  | office work               | 17        | 14.2    |

|   |                                |     |       |
|---|--------------------------------|-----|-------|
| Period of Service                               | Less than 5 years              | 37  | 30.8  |
|   | From 5 – 10 years              | 31  | 25.8  |
|   | From 11 – 15 years             | 18  | 15.0  |
|   | From 16 – 20 years             | 13  | 10.8  |
|   | From 21 – 25 years             | 8   | 6.7   |
|   | Above to 26 years              | 13  | 10.8  |
| Training in the recycling of agricultural waste | No                             | 76  | 63.3  |
|   | Yes                            | 44  | 36.7  |
| Training in Environmental conservation          | No                             | 54  | 45.0  |
|   | Yes                            | 66  | 55.0  |
| Source information                              | Training courses               | 56  | 19.4% |
|   | Radio and television           | 51  | 17.7% |
|   | Scientific studies and journal | 59  | 20.5% |
|   | Newspapers and magazines       | 40  | 13.9% |
|   | Internet                       | 82  | 28.5% |
| Total   |                                | 120 | 100.0 |

### 3. KNOWLEDGE OF SPECIALISTS WITH RECYCLING AGRICULTURAL WASTE

From the data and results contained in Table (3), it was found that the general average is 4.00 with a standard deviation of 0.855 at a high level. From the table also, the indicator comes (Encouraging organic agriculture and working to maximize its profits and reduce production costs is very important) in the first place and with a high level Very, with an average of 4.60, with a standard deviation of 0.571. While the indicator (The responsibility for the disposal and recycling of agricultural waste to benefit from it rests solely with the state.) came in the last rank with an average of 2.43 with a standard deviation of 1.106 with a low level. This means that the respondents see the promotion of organic agriculture because it is the best way to reduce water depletion in Yemen, as Yemen suffers from water scarcity and its economic feasibility. The responsibility should be shared in the management of agricultural waste between all in order to exploit it economically and environmentally.

**Table 3 Rating of knowledge of specialists with recycling agricultural waste on Five Point (Likert scale)**

| N | Statement   |    | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree | Mean | S.D   | Level | Rank |
|---|---|----|-------------------|----------|-----------|-------|----------------|------|-------|-------|------|
| 1 | Agricultural waste as all agricultural crop outcomes.   | No | 6                 | 13       | 8         | 49    | 44             | 3.93 | 1.150 | High  | 10   |
|   |   | %  | 5                 | 10.8     | 6.7       | 40.8  | 36.7           |      |       |       |      |
| 2 | Agricultural waste cannot be used as feed and needs some pre-treatment to be suitable for use.                        | No | 1                 | 6        | 4         | 63    | 46             | 4.23 | 0.804 | High  | 7    |
|   |   | %  | 0.8               | 5        | 3.3       | 52.2  | 38.3           |      |       |       |      |
| 3 | Failure to exploit agricultural waste increases the state's costs of importing fodder materials to cover the deficit. | No | 3                 | 3        | 5         | 39    | 70             | 4.42 | 0.885 | High  | 3    |
|   |   | %  | 2.5               | 2.5      | 4.2       | 32.5  | 58.3           |      |       |       |      |
| 4 | The multiplicity of plant types residues reduces the percentage of protein in the feed.                               | No | 14                | 43       | 34        | 21    | 8              | 2.72 | 1.094 | Low   | 11   |
|   |   | %  | 11.7              | 35.8     | 28.3      | 17.5  | 6.7            |      |       |       |      |

|    |   |      |      |      |      |      |      |      |       |           |    |
|----|---|------|------|------|------|------|------|------|-------|-----------|----|
| 5  | Adding nitrogen fertilizer to improve agricultural waste increases its nutritional value.   | No   | 3    | 11   | 12   | 56   | 38   | 3.96 | 1.007 | High      | 9  |
|    |   | %    | 2.5  | 9.2  | 10   | 46.7 | 31.7 |      |       |           |    |
| 6  | The feeds obtained from recycling plant residues is considered healthy and beneficial for animals.  | No   | 2    | 2    | 14   | 69   | 33   | 4.08 | 0.780 | High      | 8  |
|    |   | %    | 1.7  | 1.7  | 11.7 | 57.5 | 27.7 |      |       |           |    |
| 7  | I support recycling crop residues for use as organic fertilizers.   | No   | 0    | 2    | 4    | 44   | 70   | 4.52 | 0.648 | Very High | 2  |
|    |   | %    | 0    | 1.7  | 3.3  | 36.7 | 58.3 |      |       |           |    |
| 8  | Encouraging organic agriculture and working to maximize its profits and reduce production costs is very important                                     | No   | 0    | 1    | 2    | 41   | 76   | 4.60 | 0.571 | Very High | 1  |
|    |   | %    | 0    | 0.8  | 1.7  | 34.2 | 63.3 |      |       |           |    |
| 9  | The responsibility for the disposal and recycling of agricultural waste to benefit from it rests solely with the state.                               | No   | 19   | 62   | 14   | 18   | 7    | 2.43 | 1.106 | Low       | 12 |
|    |   | %    | 15.8 | 51.7 | 11.7 | 15   | 5.8  |      |       |           |    |
| 10 | The media plays an effective role in raising awareness of ways to benefit from agricultural waste and to use it to improve their economic livelihood. | No   | 3    | 2    | 6    | 47   | 62   | 4.36 | 0.858 | High      | 5  |
|    |   | %    | 2.5  | 1.7  | 5    | 39.2 | 51.7 |      |       |           |    |
| 11 | The government should be encouraging the farmers by purchasing the products of recycling waste.   | No   | 1    | 2    | 5    | 61   | 51   | 4.33 | 0.712 | High      | 6  |
|    |   | %    | 0.8  | 1.7  | 4.2  | 50.8 | 42.5 |      |       |           |    |
| 12 | The government should provide all the facilities for the recycling of agricultural waste at low prices.   | No   | 0    | 2    | 4    | 59   | 55   | 4.39 | 0.639 | High      | 4  |
|    |   | %    | 0    | 1.7  | 3.3  | 49.2 | 45.8 |      |       |           |    |
|    | Level   | High |      |      |      |      |      | 4.00 | 0.855 | High      |    |

#### 4. PROCEDURES THAT MUST BE DONE TO TAKE BENEFIT OF AGRICULTURAL WASTE

The results in Table (3) indicate that the overall average is 4.47 with a standard deviation of 0.573 at a high level and that the indicator (Spread awareness among the farmers about the importance of waste recycling and its marketing methods.) came in first place with an average of 4.67, the standard deviation of 0.473 at a level very high, While the indicator (Teaching farmers how to calculate return and calculate economic viability) ranked last with an average of 4.33 with a standard deviation of 0.555 at a high level. This means that there is a significant correlation between the answers of the respondents by 95%.

**Table 4 Rating of Procedures that must be done to take benefit of agricultural waste on Five Point (Likert scale)**

| N  | Statement   |    | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree | Mean | S.D   | Rank      |    |
|----|---|----|-------------------|----------|-----------|-------|----------------|------|-------|-----------|----|
| 1  | Training agricultural extension workers on waste utilization methods.                                 | No | 0                 | 1        | 41        | 78    | 0              | 4.64 | 0.499 | Very High | 2  |
|    |   | %  | 0                 | 0.8      | 34.2      | 65    | 0              |      |       |           |    |
| 2  | Spread awareness among the farmers about the importance of waste recycling and its marketing methods. | No | 0                 | 0        | 0         | 40    | 80             | 4.67 | 0.473 | Very High | 1  |
|    |   | %  | 0                 | 0        | 0         | 33.3  | 66.7           |      |       |           |    |
| 3  | Provide the necessary equipment for the recycling process and train them on it.                       | No | 0                 | 0        | 3         | 52    | 65             | 4.52 | 0.550 | Very High | 4  |
|    |   | %  | 0                 | 0        | 2.5       | 43.3  | 54.2           |      |       |           |    |
| 4  | Training the farmers to make bales.   | No | 0                 | 1        | 10        | 53    | 56             | 4.37 | 0.673 | High      | 8  |
|    |   | %  | 0                 | 0.8      | 8.3       | 44.2  | 46.7           |      |       |           |    |
| 5  | Providing places for recycling and storing waste.   | No | 0                 | 1        | 3         | 62    | 54             | 4.41 | 0.587 | High      | 7  |
|    |   | %  | 0                 | 0.8      | 2.5       | 51.7  | 45             |      |       |           |    |
| 6  | Training farmers on how to calculate the costs of the agricultural waste recycling process.           | No | 0                 | 1        | 4         | 68    | 47             | 4.34 | 0.587 | High      | 9  |
|    |   | %  | 0                 | 0.8      | 3.3       | 56.7  | 39.2           |      |       |           |    |
| 7  | Teaching farmers how to calculate return and calculate economic viability.                            | No | 0                 | 0        | 5         | 70    | 45             | 4.33 | 0.555 | High      | 10 |
|    |   | %  | 0                 | 0        | 4.2       | 58.3  | 37.5           |      |       |           |    |
| 8  | Educating farmers about the benefit of compost resulting from recycling agricultural waste.           | No | 0                 | 0        | 2         | 64    | 54             | 4.43 | 0.530 | High      | 6  |
|    |   | %  | 0                 | 0        | 1.7       | 53.3  | 45             |      |       |           |    |
| 9  | Introduce farmers to the importance of disposing of field and animal wastes.                          | No | 1                 | 3        | 3         | 48    | 65             | 4.44 | 0.742 | High      | 5  |
|    |   | %  | 0.8               | 2.5      | 2.5       | 40    | 54.2           |      |       |           |    |
| 10 | Familiarizing farmers with the harmful effects of the wrong disposal of agricultural waste.           | No | 0                 | 0        | 2         | 47    | 71             | 4.58 | 0.529 | Very High | 3  |
|    |   | %  | 0                 | 0        | 1.7       | 39.2  | 59.2           |      |       |           |    |
|    |   |    | High              |          |           |       |                | 4.47 | 0.573 | High      |    |

## 5. MEASURING THE ROLE OF SPECIALISTS' KNOWLEDGE IN THE PROCEDURES TO BE TAKEN TO BENEFIT FROM AGRICULTURAL WASTE.

In order to know the role of the general knowledge of agricultural specialists on the procedures to be followed for the recycling of agricultural waste, a simple linear regression model was used in the table (5), in which the general knowledge indicts is considered as an explanatory variable, and the variable of procedures to be followed for the recycling of agricultural waste as a dependent variable. It was clear from the results of the regression that the correlation between the independent (predictive) and the dependent variable was value 0.40, and this is considered a low correlation. The percentage of variance in the dependent variable (procedures) that is explained by the independent variable (knowledge) is 0.167. This means that knowledge explains the discrepancy of 16% of the expected practices, given the coefficient of determination ( $r^2$ ). It is also evident from the value of F 23.586 and the significance of 0.000b that the regression model is statistically significant. This means that it can be used to predict the effect of the independent variable (explainer) on the dependent variable.

**Table 5 Regression to study the role of knowledge of specialists about recycling agricultural waste on procedures that must be done to take benefit of agricultural waste**

| Dependent Variable | Predictors | R                 | R Square | F      | Sig.              | B Unstandardized Coefficients | Beta Standardized Coefficients | T     | Sig. | VIF   |
|--------------------|------------|-------------------|----------|--------|-------------------|-------------------------------|--------------------------------|-------|------|-------|
| Procedures         | (Constant) | .408 <sup>a</sup> | .167     | 23.586 | .000 <sup>b</sup> | 26.417                        |                                | 6.979 | .000 |       |
|                    | Knowledge  |                   |          |        |                   | .382                          | .408                           | 4.857 | .000 | 1.000 |

It also appears from the data of the same table (5) that the value of the constant factor is 26.417, which is the size of the effect available in the absence of knowledge. As it becomes clear that the unstandardized beta value of the regression coefficient is 0.382, which is the value that represents the role of knowledge in the regression equations. While the standardized beta value of knowledge is 0.408, which means that the percentage of the role of knowledge on procedures that contribute to improving the benefits of recycling expected agricultural waste is 40% since this value is positive. This means that knowledge has a positive role in expected practices, as the increase in knowledge leads to an increase in the efficacy of procedures. And the significance of t 0.000 indicates that the effect of knowledge among specialists on the procedures to be followed for the recycling of agricultural waste is considered to have a statistically significant effect, and the value of t was 4.857 indicating that as long as its value is greater than 2, it means that the more knowledge improves, the more effective the procedures and effectiveness on the recycling of agricultural waste. The results of the table also revealed that the factor of inflation of the variance results of the model was 1.000, which is less than 3, which indicates that there is no problem of linear multiplicity between the model variables.

## CONCLUSIONS

The results of the study indicate that there is a positive effect and that the percentage of this effect in the application of the procedures amounted to 40%, which means that when the knowledge of agricultural specialists increases, the impact of the role of knowledge increases even more in the application of the procedures to be followed in order to benefit from the agricultural recycling, but at present it has a role but it is not large, but rather close to the average in the application of procedures for the recycling of agricultural waste to benefit from it. This indicates that agricultural extension workers or specialists cannot transfer this knowledge at the required level to farmers or government agencies to apply it. It may be the result of weak existing capabilities, whether material or technical, due to the ongoing war in Yemen, or that there is a weakness in the knowledge of workers in the governmental agricultural sector to apply it to reality. In addition, the percentage of male respondents was more than female, and this indicates that most of the workers in agriculture are male and that females are limited to specialities related to health and schools. This puts a lot of difficulties in transferring knowledge to female farmers since most of those who work in agriculture are female, and also that male agricultural specialists have not transferred this knowledge to female farmers as a result of existing customs and traditions.

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